MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2016/2017

EBM7011 – QUALITY SYSTEMS MANAGEMENT

(MScEBM)

5th JUNE 2017
2:00 pm - 4:00 pm
(2 Hours)

INSTRUCTION TO STUDENTS

1. This Question paper consists of **12** pages, including cover page, with **2** sections. Attempt **ALL** questions.
2. **Section A** consists of Multiple Choice Questions. Write your answers on the Multiple Choice answer sheet given and attach it together with your answer Booklet of **Section B**.
3. **Section B** consists of descriptive and statistical questions. Provide your solutions on the answer Booklet given. Any graphs drawn on graph papers must be attached together with the answer Booklet.

SECTION A: Multiple Choice Questions, answer All (25 Marks)

1. Which of the following statements correctly define the meaning of Quality:
   (i) Degree of excellence
   (ii) Fitness for use
   (iii) Conformance to requirements
   (iv) Reliable and serviceable
   (v) Delighting the customers by meeting the needs and expectations

   (a) (i)
   (b) (ii), (iii)
   (c) (i), (ii), (iii)
   (d) (ii), (iv), (v)
   (e) All the above

2. You are the Project Manager of a company that manufactures fibre cable connectors. As part of Quality Control, you decide to inspect only 5% of the connectors generated for environmental check. Which technique are you using?
   (a) Pareto Diagram
   (b) Control Charts
   (c) Statistical Sampling
   (d) Sample Selection
   (e) Benchmarking

3. The plan-do-study-act cycle is also known as the..
   (a) TQM activity approach.
   (b) Deming cycle/wheel.
   (c) Continuous improvement cycle.
   (d) Action wheel.
   (e) Quality circle.

4. One common definition of quality, which focuses on measuring how well the product or service meets targets and tolerances as determined by its designers is..
   (a) Fitness for use.
   (b) Value for price paid.
   (c) Technical perception.
   (d) Judgmental evaluation.
   (e) Conformance to specifications.

5. The definition of quality that involves the product functioning as expected without failure is..
   (a) Performance.
   (b) Conformance.
   (c) Reliability.
   (d) Standardization.
   (e) Endurance.

Continued....

6. Just-in-time philosophy is applicable in all of the following, except:
   (a) Service organizations
   (b) Manufacturing organizations
   (c) Assembly line operations
   (d) Supermarkets
   (e) Education

7. Unevenness or variation in quality, cost, or delivery is
   (a) generally accepted.
   (b) a part of Green Belt activity.
   (c) due to scheduling.
   (d) a non-value activity.
   (e) a type of waste.

8. In six-sigma, the level of defects is reduced to approximately
   (a) 2.4 parts per million.
   (b) 1.4 parts per million.
   (c) 24.4 parts per million.
   (d) 3.4 parts per million.
   (e) 4.4 parts per million.

9. A six-sigma team has been formed to improve an existing process. Which of the following tools should the team use first to gain a clear understanding of the current process?
   (a) Flowchart
   (b) Pareto chart
   (c) Process FMEA
   (d) Taguchi Loss Function
   (e) Check sheet

10. When analysing quality for a project, a Project Manager will normally use a tool that provides a creative way to look at the causes or potential causes of a problem. Which tool is the Project Manager planning to use?
   (a) Pareto analysis
   (b) Control chart
   (c) Statistical sampling
   (d) Ishikawa diagram
   (e) Flow chart

11. In SPC, p-chart is used to monitor the manufacturing process when
   (a) only the number of defective items is known, but not the total samples.
   (b) the number of defective items and the total number of samples are known.
   (c) changes in the mean of measured samples are to be monitored.
   (d) the standard deviation or variability of measured samples is to be monitored for improvement purposes.
   (e) control charts for variables are not available.

Continued....

12. The quality improvement tool defined by best practices is
    (a) quality function deployment.
    (b) benchmarking.
    (c) quality by design.
    (d) ISO 14000.
    (e) GMP.

13. Abata Enterprise Ltd spent the following quality costs at the beginning of 2014.
    Evaluating finished product $55,000
    Quality auditor training $25,000
    Manufacturability study $20,000
    Repairing finished product $25,000
    Process capability studies $30,000

    How much did the company spend on prevention costs?
    (a) $15,000
    (b) $75,000
    (c) $70,000
    (d) $145,000
    (e) $75,000

14. The following quality gurus are matched with their best known contributions to quality, except
    (a) Walter Shewhart – PDSA cycle.
    (b) Kaoru Ishikawa – Cause and Effect diagram.
    (c) Deming – 14-Points for management.
    (d) Philips Colby – quality is free.
    (e) Joseph Juran – Juran Method.

15. In statistical quality control, variation in the production process leads to
    (a) quality defects.
    (b) process improvement opportunities.
    (c) quality improvements.
    (d) product consistency.
    (e) service improvements.

16. For the standard normal distribution, how much confidence is provided within 2 standard deviations above and below the mean?
    (a) 97.22%
    (b) 95.44%
    (c) 99.74%
    (d) 99.87%
    (e) 90.00%

Continued....

17. In statistical process control, what measures the central tendency of a set of data?
    (a) Coefficient of variation
    (b) Variance
    (c) Standard deviation
    (d) Mean
    (e) Range

18. What are the four most common control charts?
    (a) x-bar, R, p, c
    (b) x-bar, R, p, OC
    (c) x-bar, R, c, OC
    (d) x-bar, p, c, OC
    (e) R, p, c, OC

19. Upper and lower control limits are usually set at $\pm x$ standard deviations from the mean. What is the value of x ?
    (a) 0.5
    (b) 1.0
    (c) 2.0
    (d) 3.0
    (e) 6.0

20. For the standard normal distribution, how much confidence is provided within 3 standard deviations above and below the mean?
    (a) 97.22%
    (b) 95.44%
    (c) 99.74%
    (d) 99.87%
    (e) 90.00%

21. The Six Sigma approach is organized around a _____ plan known as _____.
    (a) four step, PDAC
    (b) four step, DMAC
    (c) five step PDACR
    (d) five step DMAIC
    (e) five step, DMCRA

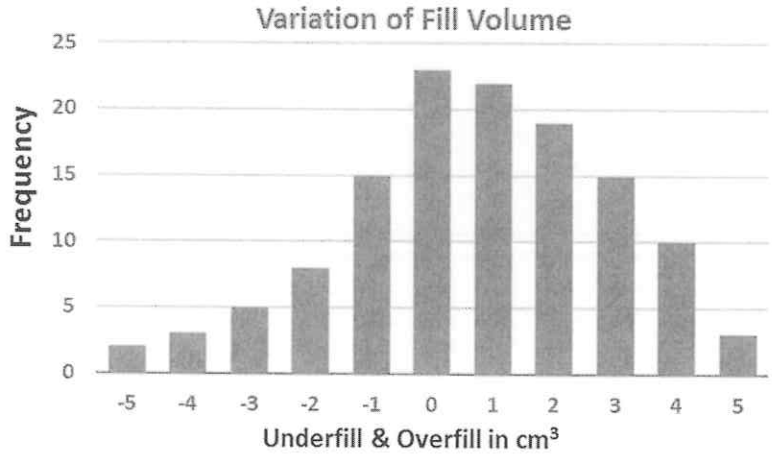
22. In six-sigma programs, individuals who have extensive training in the use of technical tools and are responsible for carrying out the implementation of Six Sigma are _____.
    (a) black belts
    (b) green belts
    (c) blue belts
    (d) red belts
    (e) white belts

Continued....

23. For consumer products, an increase in the percentage of returned goods most likely equates to an increase in? – select only one which is the most relevance.
    (a) product not meeting specifications
    (b) end-user dissatisfaction
    (c) internal reject rates
    (d) nonconforming material costs
    (e) nonconforming cost of quality

24. Quality is:
    (a) Zero defects found
    (b) Conformance to requirements
    (c) The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs
    (d) (b) and (c)
    (e) All the above

25. The Head of Quality Assurance Department has specified that a product must contain at least the volume printed on the label. He wants to reduce the amount of overfilled, the variation of which is shown in the chart below.



On the basis of the data above, what is the most effective strategy to accomplish this task?
    (a) Decrease the target fill volume only
    (b) Decrease the target fill variation only
    (c) First, decrease the target fill variation, then decrease the target fill volume
    (d) First, decrease the target fill volume, then decrease the target fill variation
    (e) First, decrease the target fill variation, then increase the target fill volume

Continued....

SECTION B

Question 1

(a) The contributions of the management guru Joseph Juran, embodied in his *Quality Control Handbook*, are a classic guide in the implementation of continuous improvement initiatives. As a quality manual, the *Handbook* outlines Juran's management ideas and methodology.

(i) Name this methodology and draw its model by indicating the main components, and show the difference sequence of implementation over time. [6 marks]

(ii) For each of these components, briefly describe its objective(s) and indicate how to achieve this/these objective(s). [9 marks]

(b) The fundamental principle of Total Quality Management (TQM) is that a work activity is a *process*.

(i) With the help of a suitable diagram, discuss the dual role of a process owner that changes from a *customer* to a *supplier*. [5 marks]

(ii) From your explanation to Question 1(b)(i) above, describe how a supplier of an organisation is linked to the organisation's eventual customers. [5 marks]

Question 2

(a) Dale Besterfield suggests that, leaders as internal change agents, have important roles to play in ensuring a quality improvement initiative is successful. Explain why is leadership important to the achievement of a quality initiative. [4 marks]

(b) A TQM initiative in an organisation requires technical *tools* and people's participation. Give four examples of these tools and briefly describe how they are used in TQM implementation. [4 marks]

(c) One important aspect of implementing Six Sigma initiative in an organisation is the involvement of its people. In terms of training and knowledge, describe how are people of such an organisation classified. [4 marks]

(d) The ISO 9000:2015 is the latest revision of the ISO 9001 standard. It is a set of quality management system standards that is founded on a set of Quality Management Principles (QMP).

(i) Identify all the QMPs of ISO9000:2015 and describe briefly the purpose of any 3 (Three) of these management principles. [9 marks]

(ii) Identify and briefly describe the QMP of ISO 9001's earlier revision, which has now been omitted in Revision 2015. [4 marks]

Continued....

Question 3

(a) Luxury Cosmetic Ltd plans to improve the reliability of its manufacturing process. Its Pearl Gel's operation consists of 3 (Three) subsystems as shown in Figure Q3(a)(i). After a scheduled preventive maintenance activity was carried out on Subsystems A and C, the maintenance team has found that the probability of each of these subsystems to operate is 99.99%.

(i) Calculate the reliability of Subsystem B if the overall reliability of the production system, R_S was estimated to be 0.9990. [2 marks]

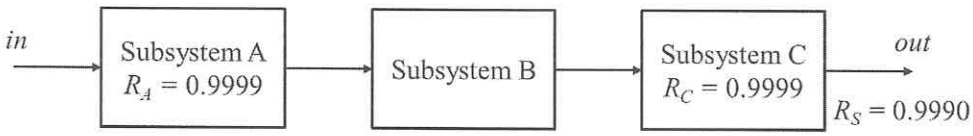


Figure Q3(a)(i): Pearl Gel Subsystems

(ii) Subsystem B in Question Q3(a)(i) however consists of two subsystems, namely Subsystem B_1 and Subsystem B_2. as shown in Figure Q3(a)(ii). Subsystem B1 has been measured to have a reliability of 99.7%. Calculate the reliability of Subsystem B_1. [3 marks]

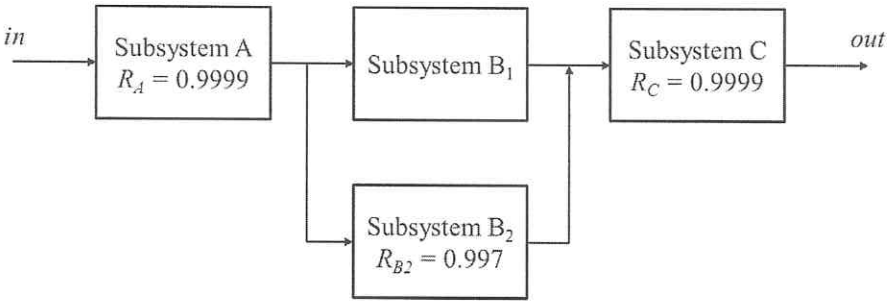


Figure Q3(a)(ii): Improvement of Pearl Gel Subsystems

Continued....

(b) Luxury Cosmetics Ltd has initiated a company-wide TQM initiative to improve the quality of its products. For its 250mg toothpaste line, the QC inspector of the company has taken 15 (Fifteen) weight samples with 4 (Four) observations each. The data and the computed means are shown in Table Q4 below. If the standard deviation of the fully-filled toothpaste tube is 2.10mg, perform the followings:

(i) Complete Table Q3(b) by calculating the remaining mean volume of the soft drink content ($\bar{X}$) and the range, R, of each sample. [2 marks]

(ii) Find the average of the sample means ($\bar{\bar{X}}$) and the mean range ($\bar{R}$) of the samples. [4 marks]

(iii) Calculate and develop the control limits of 3 standard deviations, for the x-bar chart of the manufacturing operation. [4 marks]

(iv) Plot the x-bar chart showing both the upper and lower control limits. [4 marks]

(v) Using the Table of Control Chart Constants for R-Chart (see Page 11), determine the Upper Control Limit (UCL) and Lower Control Limit (LCL) of the R-bar chart and plot the graph. [6 marks]

Sample Number	Toothpaste weight in milligram				Average $\bar{x}$	Range R
	Observation 1	Observation 2	Observation 3	Observation 4		
1	248.37	251.03	253.07	249.62	250.52	4.70
2	252.60	250.72	248.37	250.88	250.64	4.23
3	252.29	249.31	249.78	249.15	250.13	3.13
4	253.07	248.37	246.65	249.62	249.43	6.42
5	247.59	248.53	251.82	252.29	250.05	4.70
6	249.78	250.88	252.91	251.19	251.19	3.13
7	246.80	254.01	250.88	248.53		
8	247.90	249.78	251.03	249.78		
9	251.35	250.41	247.59	247.59		
10	245.08	249.62	251.50	251.50		
11	252.44	252.29	250.88	247.90		
12	246.33	248.37	252.60	253.07		
13	248.37	250.72	246.65	250.41		
14	246.49	248.21	250.09	252.29		
15	253.85	250.88	252.29	249.15		

Table Q3(b)

End of Page

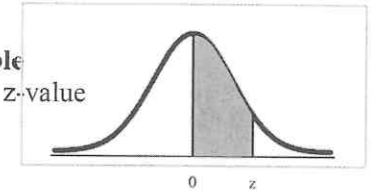
Relevant Equations

1	$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$	$\sigma_{(x)} = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}$	$\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N} (x_i - \mu)^2}$
2	$\mathrm{UCL}_{(\bar{x})} = \bar{\bar{x}} + z\sigma_{\bar{x}}$	$\mathrm{LCL}_{(\bar{x})} = \bar{\bar{x}} - z\sigma_{\bar{x}}$	$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$
3	$\mathrm{UCL}_{(R)} = D_4\bar{R}$	$\mathrm{LCL}_{(R)} = D_3\bar{R}$	
4	$\mathrm{UCL}_{(P)} = \bar{p} + z(\sigma_p)$	$\mathrm{LCL}_{(P)} = \bar{p} - z(\sigma_p)$	$\sigma_p = \sqrt{\frac{\bar{P}(1-\bar{P})}{n}}$
5	$\mathrm{UCL}_{(c)} = \bar{c} + z\sigma_c$	$\mathrm{LCL}_{(c)} = \bar{c} - z\sigma_c$	$\sigma_c = \sqrt{\bar{c}}$
6	System Reliability	$R_{SP}(t) = 1 - \prod_{i=1}^{n} [1 - R_i(t)]$	$R_{SS}(t) = R_1 \times R_2 \times R_3 \times .....R_n$

Table of Control Chart Constants for R-Chart

Sample Size n	D_3	D_4
2	0	3.267
3	0	2.574
4	0	2.282
5	0	2.114
6	0	2.004
7	0.076	1.924
8	0.136	1.864
9	0.184	1.816
10	0.223	1.777
11	0.256	1.744
12	0.283	1.717
13	0.307	1.693
14	0.328	1.672
15	0.347	1.653
16	0.363	1.637
17	0.378	1.622
18	0.391	1.608
19	0.403	1.597
20	0.415	1.585
21	0.425	1.575
22	0.434	1.566
23	0.443	1.557
24	0.451	1.548
25	0.459	1.541

TABLE A: The STANDARD NORMAL DISTIBUTION Table
"Cell" entries are areas under the N(0,1) curve between 0 and the z-value



NOTE: In calculating a z-value before entering these tables, always round correctly to two places of decimal.

0.0000	0.0100	0.0200	0.0300	0.0400	0.0500	0.0600	0.0700	0.0800	0.0900	
0.0000	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1000	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2000	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3000	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4000	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5000	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6000	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7000	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8000	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9000	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0000	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1000	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2000	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3000	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4000	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5000	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6000	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7000	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8000	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9000	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0000	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1000	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2000	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3000	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4000	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5000	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6000	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7000	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8000	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9000	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0000	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990

Template for Question 3(b)

(To be stapled together and submitted with the answer script, if used)

Student ID: | | | | | | | | | | |

Sample Number	Toothpaste weight in milligram				Average $\bar{x}$	Range R
	Observation 1	Observation 2	Observation 3	Observation 4		
1	248.37	251.03	253.07	249.62	250.52	4.70
2	252.60	250.72	248.37	250.88	250.64	4.23
3	252.29	249.31	249.78	249.15	250.13	3.13
4	253.07	248.37	246.65	249.62	249.43	6.42
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13	248.37	250.72	246.65	250.41		
14	246.49	248.21	250.09	252.29		
15	253.85	250.88	252.29	249.15		